Digital-Multimeter

DMM PROSKIT

03-9303C

OPERATIONAL MANUAL

1 INIRODUCTION

This instrument is compact, rugged, battery operated, handheld $3^1/_2$digit digital multimeter for measuring DC and AC voltage,DC and AC current,Resistance and Diode, Capacitance,Transistor, continuity Test and temperature or frequency
The Dual-slope A-D Converter uses C-MOS technology for auto-zeroing,polarity selection and over-range indication.Full overload protection is provided.It is an ideal instrument for use in the field,laboratory,workshop,hobby and'home applications.

2.FEATURES

★ Push-button ON-OFF power switch.
★ Single 30 position easy to use rotary switch for FUNCTION and RANGE selection.
★ High sensitivity of 100μV.
★ Automatic overrange indication with the "1" displayed.
★ Automatic polarity indication on DC ranges.
★ All ranges fully protected.
★ Resistance measurements 0.1Ω to 200MΩ
★ Capacitance measurements 1pF to 20μF.
★ Diode testing with 1mA fixed current.
★ Transistor hFE Test With ib- 100μA.
★ Temperature measurement with or without K type thermocouple.

3.SPECIFICATIONS

Accuracies are ± (% reading + No. of digits)
Gurranteed for 1 year, 23℃ ± 5℃ , less than 75% RH.

DC Voltage

RANGE	ACCURACY	RESOLUTION
200mV	± 0.5%. of rdg ± 1 digit	100μV
2V		1mV
20V		10mV
200V		100mV
1000V	± 0.8%. of rdg ± 2 digit	1V

Input Impedance: 10M ohm on all ranges.
Overload Protection:1000V dc. or peak ac on all ranges.

AC Voltage

RANGE	ACCURACY	RESOLUTION
200mV	± 1.2%, of rdg ± 3 digits	100μV
2V	± 0.8%, of rdg ± 3 digits	1mV
20V		10mV
200V		100mV
700V	± 1.2%, of rdg ± 3 digits	1V

Input Impedance:10M ohm on all.ranges.
Frequency Renge:40Hz to 400Hz
Overload Protection:750V rms or 1000V peak continuous on ac ranges,except.
200mV ac range (15 seconds maximum above 300V rms).
Indication:Average (rms of sine wave).

DC Current

RANGE	ACCURACY	RESOLUTION
2mA	± 0.8%, or rdg ± 1 digit	1μA
20mA		10μA
200mA	± 1.2%, or rdg ± 1 digits	100μA
20A	± 2%, or rdg ± 5 digits	10mA

Overload protection:0.2A/250V fuse, (20A range not fused.)
Maximum Input Current:20A, 15 sec.

AC Current

RANGE	ACCURACY	RESOLUTION
20mA	± 1.2%,or rdg ± 3 digits	10μA
200mA	± 2.0%, of rdg ± 3 digits	100μA
20A	± 3%, of rdg ± 7 digits	10mA

Overload Protection:0.2A/250V fuse. (20A range not fused.)
Frequency Range:40Hz to 400Hz.
Maximum Input Current:20A 15 sec.
Indication:Average (rms of sine wave)

Resistance

RANGE	ACCURACY	RESOLUTION
200 ohm	± 0.8%, of rdg ± 3 digits	0.1 ohm
2k ohm	± 0.8%, of rdg ± 1 digits	1 ohm
20k ohm		10 ohm
200k ohm		100 ohm
2M ohm		1k ohm
20M ohm	± 1%, of rdg ± 2 digits	10K ohm
200M ohm	± 5%, of (rdg −10 digits) ± 10 digits	100K ohm

On 200M ohm range, if short the two test leads, display reading is 10 digits, this 10 digits should be subtracted from measurement results.

Capacitance

RANGE	ACCURACY	RESOLUTION
2000pF	± 2.5%, of rdg ± 5 digits	1PF
20nF		10PF
200nF		100PF
2μF		1nF
20μF		10nF

Temperature

RANGE	TEMPERATURE RAGE	ACCURACY	RESOLUTION
T	★ −50℃ −400℃	± 0.75% of rdg ± 3℃	1℃
	★ 400℃ −1000℃	± 1.5% of rdg ± 15℃	1℃
	★ ★ 0℃ −40℃	± 2℃	1℃

★ Using K type thermocouple probe
★ ★ Build−in temperature sensor

Frequency Test

Range	Accuracy	Resolution
20KHz	± 1% of rdg ± 1 dight	10Hz

Overload Protection:AC 220 Vrms.

4.GENERAL CHARACTERISTICS

Maximum.Display	:1999 counts ($3^1/_2$digits) with automatic polarity indication and eng.unit.
Indication Method	:LCD display.
Measuring Method	:Dual-Slope integration A-D converter system.
Overrange Indication	:"1"Figure only in the display.
Maximum common mode voltage	:500V dc/ac rms.
Reading rate	:2-3 reading per sec (approximate).
Temperature for guaranteed accuracy	:23℃ to ± 5℃.
Temperature Ranges	:Operating 0℃ to 40℃, 32° F to 104° F.Storage -10℃ to 50℃, 14° F to 122° F.
Power Supply	:One 9-volt battery (NEDA 1604 6F22 TYPE or equivalent).
Low Battery Indication	:  to left of display.
Size	:88W × 170D × 38H m/m.
Weight	:340g (including 9 volt batteries).
Accessories	:Operating manual,Set of test leads.
Optional Accessories	:Thermocouple (K type, 400℃), Spare fuse (200mA/250V fast below type), 9V Battery (Zinc-Carbon type.) Soft Carring case.

5.OPERATION

1.Check the 9-volt battery by setting the ON-OFF switch to ON.If the battery is weak,a  sign will appear on the display.
It this does not appear on the display,proceed as below,See MAINTENANCE if the battery has to be replaced.

2.The mark,or sign,  next to the test lead jacks,is for warning that the in-put voltage or current should not exceed the indicated values.
This is to prevent demage to the internal circuity.

3.The function switch should be set to the range which you want to test before operation.

4.If the voltage or current range is not known beforehand set the FUNCTION switch to a high range and work down.

5.When only the figure "1" is displayed,overrange is being indicatea and the FUNCTION switch must be set to a higher range.

5.1)DC Voltage Measurement

1.Connect the BLACK test lead to the COM jack and the.RED test lead to the

V/Ωjack.

2.Set the FUNCTION switch to the V⎓range to be used and connect the test leads across the source or load under measurement.
The polarity of the RED lead connection will be indicated at the same time as the voltage.

Note:

⚠ Do not apply more than 1000V to the input.Indication is possible at higher voltages but there is danger of damaging the internal circuity.

5.2)AC Voltage Measurement

1.Connect the BLACK test lead to the COM jack and the RED test lead to the V/Ωjack.

2.Set the FUNCTION switch to the V~ range to be used and connect the test leads across the source or load under measurement.

Note:

⚠ Do not apply more than 700V rms to the input,indication is possible at higher voltages but there is danger of damaging the internal circuitry.

5.3)DC Current Measurement

1.Connect the BLACK test lead to the COM jack and the RED test lead to the mA jeck for a Maximum of 200mA.For a maximum of 20A,move the red test lead to the 20A jack.

2.Set the FUNCTION switch to the A⎓ range to be used and connect the test leads in series with the load under measurement.The polarity at the RED test lead connection will be indicated at the same time as the curren.

Note:

⚠ The Maximum input current is 200mA,or 20A depending on the jack used.Excessive current will blow the fuse which must be replaced.The 20A range is not protected by a fuse.The fuse rating should be 200mA and no'more to prevent damage to the internal circuitry. The Maximum terminal voltage drop is 200mV.

5.4)AC Current Measurement

1.Connect the BLACK test lead to the COM jack and the RED test lead to the mA jack for a maximum of 200mA.For a maximum of 20A,move the RED test lead to the 20A jack.

2.Set the FUNCTION switch to the A~ range to be used and connect the test lead in series with the load under measurement.

Note:

⚠ The Maximum input current is 200mA,or 20A depending upon the jack used.Excessive current will blow the fuse which must be replaced.The 20A Range is not protectrd by a fuse,The fuse rating should be 200mA and no

more. to prevent damage to the internal circuitry.
The maximum terminal voltage drop is 200mV.

5.5) Resistance Measurement

1.Connect the BLACK test lead to the COM jack and the RED test lead to the V/Ωjack.(Note:The polarity of the RED test lead is "+".)
2.Set the FUNCTION switch to the Ω range to be used and connect the test leads across the resistance under measurement.

Note:

1.If the resistance value being measured exceeds the maximum value of the range selected an over-range indication will be displayed("1") Select a higner range. For resistance of approximately 1megohm and above, the Meter may take a few seconds to become stable, This is normal for high resistance readings.
2.When the input is not connected,i.e. at open circuit, the figure"1"will be displayed for the overrange condition.
3.When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors are fully discharged.
4.200MΩ range open circuit voltage is 3V, Display reading is 10 digits when test leads short, this is normal, when measure 10MΩ resistor (on 200MΩ range). display reading is 20, measure 100Mohm (on 200M range) display reading is 110. The 10 digits is a constant and should be subtracted from the reading.

5.6)Capacitance Measurements

1. Before connecting the test capacitor, note the display which may have readings. other than zero each time the range is changed. This offset reading will not af fect the accuracy for it can be overriden by true value.
2.Connect the test capacitor to the input sockets (not test leads)noting the polarity connections when required.

Note:

1.When test individual capacitors, insert the 'eads into the two sockets, with "+"(upper socket),"-"(Lower socket),at the left of the pannel. (Capacitors should be discharged before being inserted into the test-jack.)
2.When testing polarized capacitors, for example, the tantalum type, particular attention must be paid to the polarity connections, This is to prevent possible damage to the capacitor.
When testing large capacitances, note that there will be a certain time lag before the final indication.
Units 1pF = $10^{-6}\mu$F InF = $10^{-3}\mu$F.
⚠:Do not connect an external voltage or a charged capacitor (especially larger capacitors) to the measuring terminals.

5.7) Diode Measurement and Continuity Test

1.Connect the BLACK test lead to the COM jack and the RED test lead to the V/Ωjack. (Note: The polarity of the RED test lead is "+").
2.Set the FUNCTION switch to the  range and connect the test leads

across the diode under measurement, display shows the approx forward voltage of this diode.
3. Connect the test leads to two points of circuit, if the resistance is lower than approx 30Ω. Buzzer sounds.

5.8) Transistor hFE Test

1. Set. the FUNCTION switch to the hFE range.
2. Determine whether the transistor is NPN or PNP and locate the Emitter. Base and collector leads. Insert the leads into the proper holes in the socket on the front panel.
3. The display will read the approximate hFE value at the test condition Base. Current 10μA, VCE 2.8V.

5.9) Temperature Measurement

1. Measure temperature with K type thermocouple:Set the FUNCTION switch to the T range and insert the K type thermocouple plug into K PROBE socket.
2. Measure ambient temperature without probe:On the same T range, display reading is the ambient temperature in ℃

5.10)Frequency test

1. Connect test Leads or shield cable to COM and F/V/Ωjack.
2. Set the FUNCTION switch to KHZ range, and connect test leads or cable across the source or load under measurement.

Note:

1. ⚠:Do not apply more than 220Vrms to the input, indication is possible at voltage higher than 10Vrms, but readings may be out of specification.
2. In noisy environment, it is preferable to use shield cable for measuring small signal.

5.11)Auto Power-off (Optional Function)

Automatic Power-off extends the life of the battery by turning the meter off if no rotary function switch is operated for about 15 min. The meter turns back on if either the rotary switch is turned or the power switch is pressed again.

6.MAINTENANCE

Battery and/or fuse replacement should only be done aner the test leads have been disconnected and POWER OFF

6.1)9-Volt Battery Replacement

Note the condition of the 9-volt battery using the procedure described above, if the battery needs to be replaced, open the back cover remove the spent battery and replace it with a battery of the same type.

6.2)Fuse Replacement

Should the fuse need replacement use only 200mA fuses identicial in physical size to the original.